



## Short communication

## Food-related family lifestyle associated with fruit and vegetable consumption among young adolescents in Belgium Flanders and the Veneto Region of Italy

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## ABSTRACT

The present paper examined the relationship between fruit and vegetable consumption and food-related family lifestyle (dinner with parents, family food rules, and television viewing behaviors) in a sample of 14,407 adolescents from Belgium Flanders ( $N = 7,904$ ) and the Veneto Region of Italy ( $N = 6,503$ ) using multilevel binary logistic regression analyses. The data are part of the Health Behavior in School-aged Children cross-sectional survey. Daily dinner with parents, having more strict family food rules, and low television viewing behaviors were associated with daily fruit and vegetable intake. Watching television during meals was not associated with the outcome variables.

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## Introduction

Evidence suggests that a diet rich in fruit and vegetables has a positive effect on disease prevention and weight management (Bertsias, Linardakis, Mammias, & Kafatos, 2005; Dauchet, Amouyel, & Dallongeville, 2005; Knai, Pomerleau, Lock, & McKee, 2006). Despite the health benefits of fruit and vegetable consumption, national health surveys indicate that adolescents are not consuming recommended amounts (Larson, Neumark-Sztainer, Hannan, & Story, 2007; World Health Organization, 2004a).

Many factors influence fruit and vegetable intake in adolescence and a growing number of studies suggest the importance of family environment and lifestyle (Pearson, Biddle, & Gorely, 2009; van der Horst et al., 2007). Family dinner (Gillman et al., 2000), home availability (Neumark-Sztainer, Wall, Perry, & Story, 2003; Tak, te Velde, & Brug, 2008), parental modeling (De Bourdeaudhuij & Van Oost, 2000) and parenting style (Kremers, Brug, de Vries, & Engels, 2003) are associated with fruit and vegetable intake. The role of family food rules is controversial: some studies indicated that high parental control can increase adolescents' preference for restricted foods (Fisher, Mitchell, Smiciklas-Wright, & Birch, 2002); whereas other studies have yielded an association between more strict

parental restriction and healthier eating habits (De Bourdeaudhuij, 1997; Vereecken, Keukelier, & Maes, 2004). High television viewing behavior (Boynton-Jarrett et al., 2003) and the frequent use of television during meals (Coon, Goldberg, Rpgers, & Tucker, 2001) are inversely associated with high fruit and vegetable intake among adolescents. Food-related television advertising can influence adolescents' nutritional beliefs, attitudes, knowledge and food consumption patterns (Boynton-Jarrett et al., 2003). Additionally, it has been shown that television viewing is also associated with the consumption of food not normally advertised, such as fruit and vegetables (Coon et al., 2001; Vereecken & Maes, 2006; Vereecken, Todd, Roberts, Mulvihill, & Maes, 2006).

Despite the growth in studies on the relationship between family lifestyle factors and fruit and vegetable intake, some issues remain unclear and further research is necessary to develop more effective interventions.

Although multiple factors influence fruit and vegetable intake in adolescence, most previous studies assessed only specific correlates (e.g., parenting style) and few studies have investigated the association between fruit and vegetable consumption and several food-related family lifestyle factors simultaneously. Moreover, studies investigating adolescents' family lifestyle correlates of fruit and vegetable intake have mostly been conducted in the US (Neumark-Sztainer et al., 2003), while there is a lack of studies investigating these associations in European countries.

In the present study the relationship of fruit and vegetable consumption and food-related family lifestyle (television viewing

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behaviors, evening meals with parents and family food rules) will be investigated in two large samples of Belgian-Flemish and Italian Veneto Region adolescents controlling for socio-demographic characteristics (country, gender, age and family wealth). We hypothesized that having a daily evening meal with parents, more strict family food rules, and not having heavy television viewing behaviors are positively associated with daily fruit and vegetable intake. Furthermore, even if gender (Bere, Brug, & Klepp, 2008) and country (Sandvik et al., 2005) are important variables influencing fruit and vegetable intake, there is a lack of international studies testing the moderation effect of gender and country in the relation between food-related family lifestyle variables and dietary outcomes in adolescents. For this reason we explored if gender and country acted as moderator of the impact of food-related family lifestyle on adolescents' daily fruit and vegetable intake.

## Methods

### Participants

The present data are part of the 2005–2006 Health Behavior in School-aged Children (HBSC) survey, a WHO collaborative study in 41 countries or regions. The sample was based on a cluster design with the school class as a basic unit of sampling. Participants completed the questionnaire during school hours in the classroom in the presence of a teacher. The questionnaire consisted of a number of mandatory questions and optional questions (Currie, Samdal, Boyce, & Smith, 2001). The optional questions on family food rules and some of food-related family lifestyles were only included in Belgium (Flemish speaking) and in the Veneto Region (a region in the Northeast of Italy). For this reason, only data from Belgium and the Veneto Region of Italy were used in this study and only adolescents between 11 and 16 years of age were included, resulting in a final sample of 14,407 adolescents: 7,904 adolescents (49.51% male) for Belgium Flanders and 6,503 (49.98% male) for Italy-Veneto region (Table 1).

In line with previous studies (Pearson et al., 2009; Rasmussen et al., 2006) we studied daily fruit and vegetable intake as separate outcome variables. Psychometric properties (e.g., validity, reliability) about the dependent and independent variables have been published previously (Currie et al., 2001).

**Fruit and vegetable intake:** Were assessed by asking: "How many times a week do you usually eat fruits/vegetables? (Vereecken &

Maes, 2003; Vereecken, Rossi, Giacchi, & Maes, 2008) with seven response options from "never" to "more than once a day" categorized into: (1) not daily fruit/vegetable intake and (2) daily fruit/vegetable intake.

**The family affluence scale (FAS)** is a four-item measure of socioeconomic status that investigates different family conditions of wealth (e.g., vacation with family in the past years). Responses were summed into a 0–9 scale and then divided into groups using the cut-off points recommended by previous FAS studies (Currie et al., 2008; Boyce, Torsheim, Currie, & Zambon, 2006): (1) high FAS; (2) medium FAS; (3) low FAS.

**Television during meals** was assessed by asking: "How often do you watch TV while having a meal?" with six response options ranging from "never" to "every day" and categorized into: (1) daily TV during meal; (2) not daily TV during meal. The time spent watching television during the day was measured by asking: "About how many hours a day do you usually watch television (including DVDs and videos) in your free time?" with nine response options ranging from "none at all" to "7 or more hours a day" (Vereecken et al., 2006). Based on mean hours for TV viewing, the responses were categorized into: (1) heavy TV viewing behavior ( $\geq 4$  h); (2) not heavy TV viewing behavior ( $< 4$  h).

**Dinner with family:** Was assessed using the question: "How often do you have an evening meal together with your mother or father?" (Vereecken, 2007) with six response options ranging from "never" to "every day" categorized into: (1) no daily evening meal with parents; (2) daily evening meal with parents.

**Family rules:** The family restriction rules were assessed by asking: "Do you get the following items from your parents if you ask for them?" Coke or other soft drinks that contain sugar/sweets or chocolates/biscuits or pastries/crisps. There were four response options ranging from "no, I never get that" to "I can take it when I want it". The internal consistency of the scale was good ( $\alpha = 0.89$  for Belgium versus  $\alpha = 0.88$  for Italy). The family obligation rules were measured with a five-item scale (Neumark-Sztainer, Wall, Story, & Fulkerson, 2004) asking: "Here are some statements about eating meals at home. Please say how much you agree or disagree with each one: in my family there are rules at mealtimes that we are expected to follow; in my family it is OK for a child to have something else to eat if he/she doesn't like the food being served; in my family a child should eat all the food served even if he/she doesn't like it; in my family manners are important at the dinner

**Table 1**  
Descriptive analyses (%) of daily fruit and vegetables consumption, age, FAS, food lifestyle behaviors and family rules by country and gender and significance of the difference.

Variables	Belgium-Flanders	Italy-Veneto	$p^a$	Belgium-Flanders		$p^a$	Italy-Veneto		$p^a$
	Total	Total		Boy	Girl		Boy	Girl	
	%	%		%	%		%	%	
Daily fruit intake	35.9	30.3	<0.001	30.3	41.3	<0.001	27.2	33.5	<0.001
Daily vegetable intake	58.5	34.6	<0.001	51.5	65.3	<0.001	27.5	41.7	<0.001
Age									
11–12 age	29.4	31.4		29.7	29.2		33.0	29.9	
13–14 age	34.3	31.3		34.4	34.2		31.7	31.0	
15–16 age	36.3	37.2	<0.001	35.9	36.6	0.759	35.3	39.1	0.003
FAS									
High FAS	38.5	43.5		40.9	36.2		47.2	39.9	
Medium FAS	54.5	50.7		52.7	56.1		47.6	53.7	
Low FAS	7.1	5.8	<0.001	6.4	7.7	<0.001	5.2	6.4	<0.001
Food lifestyle behaviors									
Not daily TV during meal	88.1	45.8	<0.001	86.8	89.3	<0.001	46.3	45.3	0.386
<4 h TV viewing	77.0	82.4	<0.001	75.9	78.0	0.029	82.2	82.6	0.654
Daily evening meal with parents	63.2	77.5	<0.001	59.1	64.0	0.126	76.9	78.1	0.239
Family rules									
High restriction rules	39.2	33.2	<0.001	38.6	39.8	0.279	32.3	34.1	0.127
High obligation rules	68.0	78.6	<0.001	68.5	67.5	0.348	80.1	77.1	0.003

<sup>a</sup>  $p = \chi^2$  test.

**Table 2**

Multilevel logistic regression analyses, multivariate model: odds ratios and their confidence interval for daily fruits and vegetables consumption.

Variables	Fruit			Vegetables		
	OR	99% CI	<i>p</i>	OR	99% CI	<i>p</i>
<i>Socio-demographics</i>						
Country	1.35	1.18–1.55	<0.001	3.07	2.60–3.62	<0.001
Gender	1.52	1.37–1.68	<0.001	1.88	1.70–2.08	<0.001
<i>AGE</i>						
11–12	1.00	Reference		1.00	Reference	
13–14	0.99	0.86–1.13	ns	1.09	0.95–1.25	ns
15–16	0.99	0.85–1.14	ns	1.25	1.07–1.47	<0.001
<i>FAS</i>						
Low FAS	1.00	Reference		1.00	Reference	
Medium FAS	1.02	0.83–1.26	ns	1.08	0.88–1.32	ns
High FAS	1.28	1.03–1.58	.003	1.33	1.08–1.64	<0.001
<i>Food-related family lifestyle</i>						
Not daily TV during meal	1.05	0.93–1.20	ns	1.09	0.96–1.23	ns
<4 h TV viewing	1.26	1.11–1.45	<0.001	1.23	1.09–1.41	<0.001
Daily evening meal with parents	1.20	1.09–1.35	<0.001	1.37	1.23–1.54	<0.001
High restriction rules	1.39	1.25–1.56	<0.001	1.31	1.18–1.47	<0.001
High obligation rules	1.18	1.04–1.33	<0.001	1.59	1.41–1.79	<0.001

table; in my family we don't have to eat all meals at the kitchen or dining room table" with five response options ranging from "Strongly agree" to "Strongly disagree". The internal reliability was  $\alpha = 0.55$  for the Belgian adolescents and  $\alpha = 0.51$  for the Italian adolescents. For both scales the average of the items was computed and the scales were dichotomized using 2.5 as a cut-off point.

Descriptive analyses of the variables were performed to determine country and gender differences using Chi-square tests (Table 1). Several sets of multilevel logistic regression analyses, with children at level-1 nested within schools at level-2, were carried out to investigate the associations between fruit and vegetable consumption and the food-related family lifestyle variables. In a first set (models not shown), separate analyses were conducted for each of the food-related family variables, controlling for socio-demographic characteristics (country, gender, age category and family wealth) and including interactions between the food-related family variables and gender and country. As only a few borderline interactions were found all analyses were rerun without the interaction terms. Finally, all significant food-related family variables were entered simultaneously in the same model to investigate multivariate associations controlling for socio-demographic characteristics (multivariate model, Table 2).

The independent variables were presented as dummy indicators contrasted against a base category. This allowed to compare adolescents who have habitually healthy lifestyles (e.g., usually not having meals while watching television) versus those who in general have less healthy lifestyles (e.g., daily having meals while watching television).

*p*-Values < 0.01 were considered significant. MLwiN software version 2.02 was used to calibrate the models using second order Predictive/Penalized Quasi-likelihood (PQL) approximation procedures.

## Results and discussion

Comparison by country and gender showed significant differences for all variables by country but not by gender. Belgian adolescents reported more daily fruit (35.9% versus 30.3%) and vegetable (58.5% versus 34.6%) consumption, were more likely to be heavy television viewers and have more restriction rules. However, they had less obligation rules and were less likely to watch daily TV during meals and to have daily family dinners (Table 1). According to previous studies, we found a higher percentage of daily fruit and vegetable consumption (Bere et al.,

2008; Riediger, Shooshtari, & Moghadasian, 2007) in girls than in boys in both countries. No significant gender difference was found for the frequency of evening meal with parents and restriction rules. Belgian girls watched less television both during day and during meals than boys, while no significant gender difference was found for Italian adolescents. In Italy-Veneto, boys reported higher obligation rules than girls, while no difference was found in Belgium-Flanders.

All food-related family lifestyle variables were associated with daily fruit and vegetables intake in single models (data not shown). All associations remained significant after controlling for the other food-related family variables with the exception of the habit to watch television during meals which disappeared in the multivariate model for both outcome variables.

Moreover, no significant moderating effect was found for gender and country in the associations between food-related family lifestyles variables and daily fruit and vegetable intake (data not shown). This finding suggests that, in our sample, the relation between food-related family lifestyles and daily fruit and vegetable intake is common across boys and girls and both countries.

The strongest associations were found between the restriction rules and fruit and between the obligation rules and vegetables. This result indicates the importance of studying fruit and vegetables separately and might be explained by the different circumstances in which fruit and vegetables are consumed (Vereecken et al., 2004). Fruit is more often eaten as a snack or dessert between meals and might therefore be more influenced by restriction rules on snack intake, whereas vegetables are usually eaten as part of a meal and therefore more likely to be influenced by rules during mealtimes.

A positive association was also found between daily evening meals with parents and fruit and vegetable intake, this association remained significant also in the multivariate model. Our finding show, in line with previous studies (Gillman et al., 2000), that the frequency of family dinners may improve the quality of diet in adolescence.

After controlling for the other variables, the associations between not having a daily meal while watching TV and daily fruit and vegetable intake disappeared. On the other hand, heavy TV viewing remained associated with daily fruit and vegetable intake also in the multivariate model. Our findings suggest that heavy television viewing behaviors may be associated with lower fruit and vegetable intake among adolescents (Boynton-Jarrett et al., 2003; Vereecken et al., 2006), but also that the hours of

television viewing are more important than the habit of watching television during meals for these outcome variables.

## Limitations

Several limitations of the present study need to be addressed. Firstly, given the cross-sectional design of the study, no final causal conclusion can be drawn. Secondly, we only collected adolescents' reports of parenting rules. More valid data would probably result from a design that uses multiple sources (e.g., parents, adolescents): it could be that reported parental rules differ from the adolescents' perception. Thirdly, only a crude measure was used to collect dietary data. We assessed the daily fruit and vegetable intake by using a single question for each item with no reference to the portion size or amount consumed. Fourthly, internal consistency of the obligation rules scale was relatively low. As explained by Neumark-Sztainer et al. (2004) the low reliability may be due to the assessment of different types of rules around eating. Fifthly, all data were based on self-reported measures and therefore social desirability must be considered. Finally, further individual (e.g., self-efficacy), environmental (e.g., availability) or family characteristics (e.g., parental modeling) might be other important correlates that have not been addressed in this study.

## Conclusion

In conclusion, our results showed that few adolescents had a daily fruit and vegetable intake as suggested by the international recommendations (Larson et al., 2007; World Health Organization, 2004b). The results of this study confirmed also that several lifestyle variables were related with both the outcome variables (Haerens et al., 2008). Moreover, our findings have underlined the role of parenting practices on adolescents' diet: family food rules can increase the frequency of fruit and vegetable consumption in adolescence. Furthermore, involving parents, to educate the families to adopt more strict food rules, improving adolescents' television habits and encouraging the family to eat together could increase the effectiveness of the interventions aimed at improving fruit and vegetable consumption in adolescence.

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